



LOCATION ACCURACY- THE NEED FOR INDOOR TESTING

Ex Parte Presentation

Federal Communications Commission

PS Docket 06-117

June 11, 2010

SUMMARY

- FCC should require a testing protocol that encompasses indoor accuracy reflecting consumer use
- Increased accuracy evolves from clarity of rules, enforcement and investment in existing technology
- AGPS cannot reliably and accurately provide caller location originating in many common buildings

E9-1-1 Should Reflect Consumer Behavior

Indoor Testing is Critical

- “We-- including the general public – need to know how well the E-9-1-1 systems are doing in terms of the overall accuracy with which they are locating wireless callers. Specifically, it is important to know how well they are actually performing in operational systems in the field...”
 - *Statement of Professor Dale N. Hatfield, Committee on Commerce, Science and Transportation, US Senate (April 4, 2007)*
- States report (Alabama, Texas, Virginia, Washington, Massachusetts, Delaware, and Michigan) that percentage of wireless calls range from 52% to 72% of all calls received by PSAPs
- J.D. Power 2009 study shows that 52% of all wireless calls are made indoors
- Wireless expansion to broadband services furthers the intensity of indoor use

Location Accuracy Test Results

- Test Results should be submitted to the Commission in a format inviting comparison
- Results should be publicly available
- Centralized approach permits more consistent and discerning examination of progress and the environments encountered
- Affords PSAPs and Commission ability to gauge progress , enforce standards and structure remedies

Location Technologies

AGPS and UTDOA

- TruePosition 's *White Paper (attached)* analyzes the two location technologies used by US carriers and the ability of each to locate indoor callers
 - As radio waves travel at a constant velocity, the distance between two points can be measured. Location is determined by examining the time lapse between two points of the travelling signal
- The AGPS handset signals from satellites is one of the two geolocation technologies
- The visibility of the receiver handset to a minimum number of satellites is crucial
 - When satellite visibility is seriously blocked,-- urban canyons or inside a building, the AGPS system is not able to produce a location
- AGPS cannot reliably and accurately provide caller location originating in many common buildings

Location Technologies

A-GPS and U-TDOA

- U-TDOA, the other US market geolocation technology, determines location by comparing time difference of the cell signal reaching each Location Measuring Unit (LMU) installed in the network's base stations
- U-TDOA technology works very well in urban, suburban, and indoor environments , U-TDOA is network-based and deployed continent-wide
- U-TDOA suffers in extreme rural conditions where cell sites are arranged in a "string of pearls" configuration
- Accuracy increases as number of LMUs increase, a function of carrier investment
 - Accuracy influenced by signal- to- noise ratio of the received signal, the bandwidth of the transmitting signal and the time available to process the information from multiple antennas
 - Where LMUs are not densely deployed , in-building performance is degraded as compared to more fully deployed network

Record Affirms that AGPS is Not A Universal Solution

- *“Nevertheless, AGPS cannot today, nor in the foreseeable future, meet the E911 Phase II accuracy requirements in each and every PSAP on a PSAP-by-PSAP basis”*
- *“While these hybrid [A-GPS and AFLT] approaches can be highly beneficial to maximize yield, even employing currently available hybrid solutions will not guarantee that the Phase II accuracy requirements can be met in each and every PSAPS not only because of the difference in size among the PSAPs, but also because within PSAPs there are some challenging environments in where performance can be below the norm”*
 - *Comments of Qualcomm, PS Docket 07-114 (July 5, 2007) at page 6*
- *“Because of the inherent limitations of GPS satellite visibility, however, Verizon Wireless has also deployed technology as Advanced Forward Link Trilateration (“AFLT”) which uses Time Difference of Arrival (“TDOA”) [so does GPS] based on the triangulating of signals among the handset and multiple cell sites that assist GPS or independently serve as default locations. [...] However, the AFLT portion of the solution cannot achieve the GPS derived accuracy levels [...]”*
 - *Comments of Verizon Wireless, PS Docket 07-114 (July 5, 2007) at page 18*
- *“In their comments, Verizon Wireless, Sprint Nextel, and QUALCOMM all described the technical features of AGPS solutions and how AGPS works in particular circumstances. These parties demonstrated that, in many PSAP jurisdictions throughout the country where certain topologies predominate, such as urban canyons and heavily forested areas, PSAP-level compliance with the current accuracy rule will be technically infeasible.”*
 - *Ex Parte of the Rural Carrier Association and Verizon Wireless. PS Docket 07-114 (August 31, 2007)*

Legacy, 3G and Future Networks Require More than AGPS

- AGPS does not work in environments from which most E911 calls are made
- FCC should reject proposals allowing AGPS as a universal technology , particularly in transitory environments
- Poor indoor AGPS performance, the increasing numbers of E9-1-1 calls from indoors and the number of subscribers transitioning to advanced networks would actually decrease the number of callers able to be located

UTDOA AGPS Comparison

Performance of UTDOA

Source: Comments of TruePosition, PS Docket 07-114, CC Docket 94-102 and WC Docket 05-196 (August 20, 2007) at page 6

Metric	Metric Definition	Rural Outdoor	Suburban Outdoor	Urban Outdoor	Dense Urban Outdoor	Indoor Low Penetration	Indoor High Penetration
Accuracy 67 percent (m)	67 th Percentile Error In Meters	50 to 500+	65	65	65	77	90
Accuracy 95 percent (m)	95 th Percentile Error in Meters	300 to 1000+	180	180	180	1210	270

UTDOA AGPS Comparison

Performance of AGPS

Source: Comments of TruePosition, PS Docket 07-114, CC Docket 94-102 and WC Docket 05-196 (August 20, 2007) at pages 14-15

a—indicates that the technology failed to produce a location more than 33 percent of the time, preventing a 67th percentile accuracy from being computed

b— indicates that the technology failed to produce a location more than 5 percent of the time, preventing a 95th percentile accuracy from being computed

Metric	Metric Definition	Rural Outdoor	Suburban Outdoor	Urban Outdoor	Dense Urban Outdoor	Indoor Low Penetration	Indoor High Penetration
Accuracy 67 percent (m)	67 th Percentile Error in Meters	14	20	25	8995	67	a
Accuracy 95 percent (m)	95 th Percentile Error in Meters	80	284	b	b	1000	b

Path To Improvements

- Where UTDOA technology is engaged, LMUs deployed on more than 90% of cell sites achieve excellent performance indoors
- UTDOA + AGPS hybrid combines reliable indoor accuracy of UTDOA with reliable and accurate rural performance of AGPS
 - There is no significant development risk associated with the hybrid except for that associated with lack of regulatory clarity and enforcement